Spell Casting

One of Lea's passions is playing computer games. In her favourite game, many players fight together against bosses of incredible strength. Some of those players are sorcerers, some are warriors. The sorcerers can enhance the power of a warrior by casting spells. To do so, they need one magic powder per spell, a reagent that is quite rare.

Each warrior can only benefit by some spells (but by those possibly multiple times) and also has a maximum amount of spells that can be cast on him. Each sorcerer can only cast certain spells, of those he can cast as many as he likes provided he has enough magic powder. There is only a fixed amount of magic powder available. Your task is to find out the maximum amount of spells that can be cast in total.

Input

The first line of the input contains an integer t. t test cases follow, each of them separated by a blank line.

Each test case starts with four integers, n m p s, the number of warriors n and sorcerers m, the amount of magic powder available p and the number of different spells s. Spells are numbered from 1 to s.

The next n lines describe the warriors, each contains two integers c_i k_i followed by k_i more integers $s_{i,1}, ..., s_{i,k_i}$. c_i is the maximum number of spells that can be cast on warrior i, k_i the number of different spells that can be cast on warrior i, $s_{i,1}, ..., s_{i,k_i}$ are the spells that can be cast on warrior i.

The next m lines describe the sorcerers, each contains an integer a_j followed by a_j integers $t_{j,i}, ..., t_{j,a_j}$, a_j is the number of different spells sorcerer j can cast, $t_{j,i}, ..., t_{j,a_j}$ are the spells that he can cast.

Output

For each test case, output one line containing "Case #i: d" where i is its number, starting at 1, and d is the maximum amount of spells that can be cast. Each line of the output should end with a line break.

Constraints

- $1 \leq t \leq 20$
- $1 \leq m, n, p, s \leq 100$
- $1 \leq c_i \leq 100$ for all $1 \leq i \leq n$
- $1 \leq k_i \leq s$ for all $1 \leq i \leq n$
- $1 \leq a_j \leq s$ for all $1 \leq j \leq m$
- $1 \leq s_{i,k} \leq s$ for all $1 \leq i \leq n$, $1 \leq k \leq k_i$
- $1 \leq t_{j,a} \leq s$ for all $1 \leq j \leq m$, $1 \leq a \leq a_j$
- The elements $s_{i,k}$ resp. $t_{j,a}$ will be distinct elements for each i resp. j.

Sample Input 1

```
5
2 1 2 2
1 1 1
1 1 2
2 1 2

1 1 2 1
2 1 1
1 1

2 3 1 3
2 2 1 3
3 2 1 2
2 2 3
2 1 2
1 1

1 2 3 2
3 1 2
2 1 2
1 1

1 3 2 1
3 1 1
1 1
1 1
1 1
```

Sample Output 1

```
Case #1: 2
Case #2: 2
Case #3: 1
Case #4: 3
Case #5: 2
```

Sample Input 2

```
6
1 3 2 3
1 2 1 3
3 1 2 3
1 2
1 1

3 1 3 2
1 1 2
2 1 1
1 2 1 2
1 2

3 2 3 2
3 2 1 2
2 2 1 2
3 1 1
2 1 2
2 1 2

2 2 1 3
2 1 1
2 1 1
1 1
3 1 2 3

3 2 3 3
1 2 1 3
1 3 1 2 3
2 3 1 2 3
3 1 2 3
1 1

3 1 1 2
3 1 2
1 1 2
1 2 1 2
2 1 2
```

Sample Output 2

```
Case #1: 1
Case #2: 2
Case #3: 3
Case #4: 1
Case #5: 3
Case #6: 1
```